MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021 / 2022

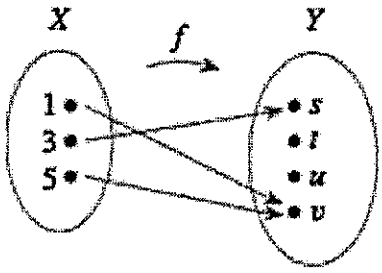
DDS5221 – DISCRETE STRUCTURES

15 AUGUST 2022
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO (2)** sections, Section A and Section B with 5 printed pages excluding the cover page.
2. Attempt ALL questions in both sections.
3. The distribution of the marks for each question is given.
4. Please write all your answers clearly on the answer booklet provided.

SECTION A: Answer all questions (10 marks)

No.	Question
1.	Given the following statement: $3 + 3 = 3$ Which of the following is TRUE? (1 mark) A. The statement is not a proposition. B. The statement is a true proposition. C. The statement is a false proposition. D. None of the above.
2.	Given the following propositional variables: p: Mary likes drawing. q: Mary likes hiking. What is the truth value of the compound proposition $p \vee q$ if proposition p is true and proposition q is false? (1 mark) A. True B. False
3.	Given the relations R on the set $S = \{1, 2, 3, 4\}$. Determine which of the following relations is reflexive. (1 mark) A. $R = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$ B. $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$ C. $R = \{(1, 1), (1, 2), (2, 1), (1, 3), (4, 4)\}$ D. $R = \{(1, 3), (2, 1)\}$
4.	Based on the arrow diagram, the co-domain is (1 mark)  A. {s, v} B. {1, 3, 5} C. {s, t, u, v} D. {(1,v), (3,s), (5,v)}

Continued.....

5. Refer to the algorithm below:

```
1  current_number = a;
2  new_number = b;
3
4  while (new_number < 10)
5  {
6     lucky_number = new_number + current _number;
7     current_number = new_number;
8     new_number = lucky_number;
9  }
```

Find the final value for new_number if a = 1 and b = 3. (1 mark)

A. 4
B. 7
C. 11
D. 18

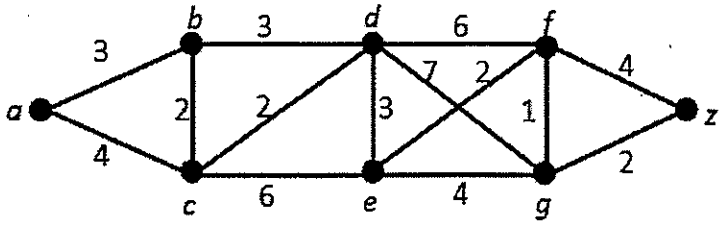
6. If there are 10 swimmers in a competition, in how many ways can they be placed first, second, and third? (1 mark)

A. 3
B. 30
C. 120
D. 720

7. In how many ways can five couples be seated in a row if each couple must be seated together? (1 mark)

A. 32
B. 120
C. 240
D. 3840

8. Based on the diagram, find the length of the shortest path between *a* and *z* in the given weighted graph. (1 mark)



A. 13 B. 14 C. 15 D. 16

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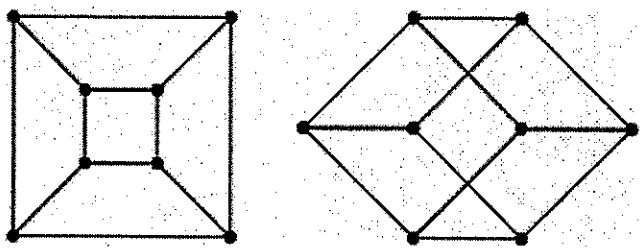
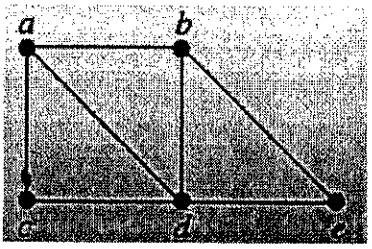
9.	The graphs as shown are isomorphic.	(1 mark)



A. True
B. False

10.	The following graph has no Euler circuit but has a Euler path.	(1 mark)



A. True
B. False

Continued.....

SECTION B: Answer all questions (30 marks)

Question 1 (10 marks)

a) Given the following recursive function: (3 marks)

```
Int function(int m)
{
 if (m == 1)
    return 0;
 else
    return ( (3*m) + function (m-1) );
}
```

Find the result of this function call: function(5).

b) Use the Euclidean Algorithm to find the greatest common divisor (GCD) of 258 and 60. (2 marks)

c) By using the Mathematical Induction, verify that the following equation is true for very positive integer n. (5 marks)

$2 + 6 + 10 + \ldots + (4n - 2) = 2n^2$

Continued.....

Question 2 (10 marks)

a) Place the numbers: 97, 88, 95, 68, 55, 96, 48, 66, 62, 99, 70 in the order in which they appear in a binary search tree. Then, find the height of this binary tree. (5 marks)

b) Based on Table 1, draw the transition diagram for the finite state automaton. (5 marks)

Table 1: State table

State	Input	
	X	Y
A	C	B
B	B	B
C	B	C

Initial state: A

Accepting state: C

Question 3 (10 marks)

a) Draw a circuit representing the given Boolean expression: $Q = AB + BC(B + C)$ (6 marks)

b) Construct a truth table for the circuit in part (a). (4 marks)

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